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LANGLEY RESEARCH CENTER

NACA

1917-2017

A Storied Legacy, a Soaring Future

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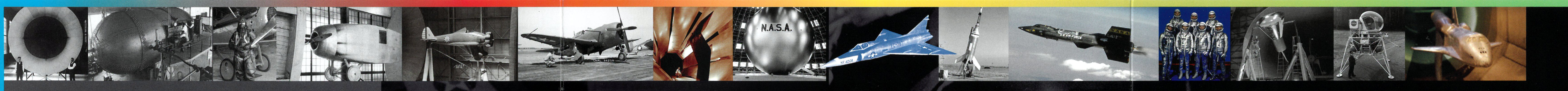


Langley Research Center 1917 - 2017: A Storied Legacy, a Soaring Future

1910s

1916: Land north of Hampton, Va., is purchased for Langley Field to house research for the Army Air Service, the U.S. Navy and the National Advisory Committee for Aeronautics (NACA).

1917: Construction begins on Langley Memorial Aeronautical Laboratory.

1920s

1920: Formal dedication of the Langley Memorial Aeronautical Laboratory.

1922: Variable Density Tunnel opens. The first pressurized wind tunnel enabled tests of scale models to more closely resemble actual flight.

1927: Propeller Research Tunnel completed. The 27-Ft test section tested engine cowling designs and fuselage interaction.

1929: Collier Trophy, given annually for the greatest achievement in U.S. aeronautics, awarded to Langley for an engine cowling that significantly reduced engine drag while maintaining engine cooling.

1930s

1931: Full Scale Tunnel becomes operational.

1931: Physical Research Division created to study aerodynamics, wing sections, propellers and fundamentals of flutter.

1933: NACA Report 460, describing 10 years of airfoil studies, produced the airfoil numbering system that is still used today.

1936: 8-Ft High Speed Tunnel to study flight approaching the speed of sound opens.

1938-45: Full Scale Tunnel studies drag reduction to improve World War II fighter aircraft performance.

1940s

1941: 20-Ft Spin Tunnel begins operation.

- NACA Report R755 first defines requirements for aircraft handling characteristics.

1945: Congress approves rocket launch facility at Wallops Island, Va. Langley's Pilotless Aircraft Division begins research.

- With U.S. Air Force and the U.S. Weather Bureau, NACA flies into thunderstorms for first in situ observations.

1947: Langley shares Collier Trophy with Bell Aircraft and Chuck Yeager for research about supersonic flight.

1949: National Unitary Wind Tunnel act enabled funding and coordination of building high-speed wind tunnels at NACA Centers and the Air Force's Aeronautical Engineering Development Center.

1950s

1950: First application of horizontal test section slots in 8-Ft High Speed Tunnel, results in more closely modeling actual transonic flight.

1951: Collier Trophy awarded for slotted-throat wind tunnel.

1952: Hypersonic Facilities Complex completed. Eight small wind tunnels with a speed range from Mach 6 to 20 tested concepts for the X-15, Mercury, Gemini, Apollo, Viking, and space shuttle.

1954: Collier Trophy awarded for the development of the Area Rule, which reduces aircraft fuselage area slightly near the wings, thus enabling transonic flight.

1955: Aircraft Landing Dynamics Facility opens to test aircraft landing gear, tires, and runway surfaces. Eventually, similar work will be done for Space Shuttle Program.

1956: Development of Scout, a 4-stage solid-fuel rocket to boost light payloads begins.

1958: Langley becomes a National Aeronautics and Space Administration (NASA) research center.

1958: The Space Task Group at Langley plans crewed space flight with Project Mercury.

- Little Joe test launch vehicle for Project Mercury begins development at Langley.

1959: Development of worldwide tracking network for Project Mercury.

1960s

1960: First successful launch of Scout rocket from Wallops, Va. Scout had a 96% success rate.

- Echo 1 launched. Langley's first satellite, a high-altitude balloon, reflected radio and radar signals as a limited communications relay. By tracking its orbit, more was learned about the density of the upper atmosphere.
- First Project Mercury spacecraft model launched from NASA Wallops Station to test escape, landing, and recovery systems.
- Transonic Dynamics Tunnel becomes operational and is used to detect and reduce flutter.
- 8-Ft High Temperature Tunnel begins testing structures for spaceflight. Later it will be used for space shuttle and scram jet research.

1963: The Rendezvous and Docking Simulator for practicing full-scale Gemini and Apollo maneuvers is completed.

1965: The Lunar Landing Facility, which was used to simulate flying the lunar lander the final 150 feet in the moon's gravity, is completed.

1966: *Surveyor I* lands on moon – first soft landing by an American spacecraft.

1966-67: Langley-led Lunar Orbiters I to V photograph potential Apollo landing sites.

1970s

1970s: Over 60,000 hours of wind tunnel studies of the space shuttle.

1973: An office was formed to study environmental concerns of supersonic flight, precursor to Langley's Atmospheric Sciences group.

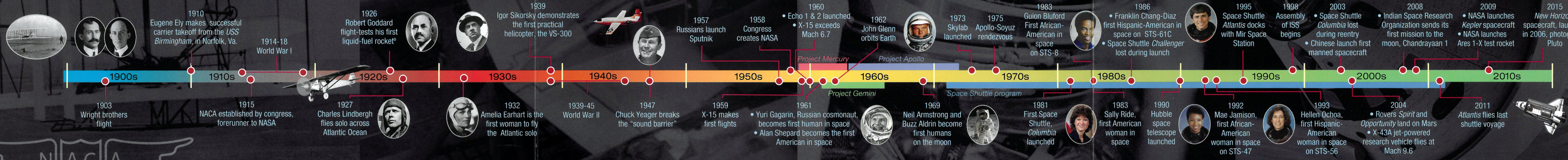
1974: Development of a photochemical model that provided the first detailed timetable for the origin and evolution of the ozone in Earth's atmosphere.

- Supercritical Airfoil to reduce drag during transonic flight is developed.

1975: Stratospheric Aerosol Measurement sensor deployed on Apollo-Soyuz.

1976: Langley-led Viking 1 & 2 missions — first and second spacecraft to land safely on Mars.

1978: Stratospheric Aerosol Measurements II on Nimbus 7 begins over 20-year record of stratospheric aerosols in polar regions.



1903
Wright brothers flight

1910
Eugene Ely makes successful carrier takeoff from the *USS Birmingham*, in Norfolk, Va.

1914-18
World War I

1915
NACA established by congress, forerunner to NASA

1926
Robert Goddard flight-tests his first liquid-fuel rocket°

1927
Charles Lindbergh flies solo across Atlantic Ocean

1932
Amelia Earhart is the first woman to fly the Atlantic solo

1939
Igor Sikorsky demonstrates the first practical helicopter, the VS-300

1939-45
World War II

1947
Chuck Yeager breaks the "sound barrier"

1957
Russians launch Sputnik

1958
Congress creates NASA

1959
X-15 makes first flights

1960
- Echo 1 & 2 launched
- X-15 exceeds Mach 6.7

1961
- Yuri Gagarin, Russian cosmonaut, becomes first human in space
- Alan Shepard becomes the first American in space

1962
John Glenn orbits Earth

1969
Neil Armstrong and Buzz Aldrin become first humans on the moon

1973
Skylab launched

1975
Apollo-Soyuz rendezvous

1981
First Space Shuttle, *Columbia* launched

1983
Guion Bluford First African-American in space on STS-8

1983
Sally Ride, first American woman in space

1986
- Franklin Chang-Diaz first Hispanic-American in space on STS-61C
- Space Shuttle *Challenger* lost during launch

1990
Hubble space telescope launched

1992
Mae Jamison, first African-American woman in space on STS-47

1993
Hellen Ochoa, first Hispanic-American woman in space on STS-56

1995
Space Shuttle *Atlantis* docks with Mir Space Station

1998
Assembly of ISS begins

2003
- Space Shuttle *Columbia* lost during reentry
- Chinese launch first manned spacecraft

2004
- Rovers *Spirit* and *Opportunity* land on Mars
- X-43A jet-powered research vehicle flies at Mach 9.6

2008
- Indian Space Research Organization sends its first mission to the moon, Chandrayaan 1

2009
- NASA launches *Kepler* spacecraft
- NASA launches Ares 1-X test rocket

2011
Atlantis flies last shuttle voyage

2015
New Horizons spacecraft, launched in 2006, photographs Pluto

1980s

1980: Process for adhering thermal protection tiles to space shuttle developed.

1981: Measurement of Air Pollution from Satellite (MAPS) experiment flown on STS-2 demonstrates that trace gases in troposphere can be measured from space.

1984: National Transonic Facility (NTF) at Langley becomes operational and provides super-cold (cryogenic) testing.

- The Stratospheric Aerosol and Gas Experiment II (SAGE II) sensor launched aboard the Earth Radiation Budget Satellite (ERBS).

1982: Studies of the HL-20 lifting body begin.

1986-93: NASA and FAA Wind Shear Program conducted, results are new procedures and technology for safer, smoother flights.

1986: Langley studies solid rocket booster O-ring materials after *Challenger* accident.

1987-98: F-18 High-Angle-of-Attack Research Vehicle flights at Dryden and Langley wind tunnels.

1988: Early observations of polar stratospheric clouds helped form an understanding of the ozone hole and chemical processes.

1980s-90s: Study of wake vortex flow physics leads to computer methods to predict aerial spray and aircraft separation standards.

1990s

1990: Long Duration Exposure Facility, proposed by Langley, is retrieved by the space shuttle after 5 years in orbit.

- Electronic display cockpit technology is developed by Langley researchers.
- Advanced Composites Technology program provides industry with technology composite aircraft components.

1991: Launch of the Halogen Occultation Experiment (HALOE), the first atmospheric science instrument to be built in-house, launched, and operated by Langley.

1994: Lidar in Space Technology Experiment (LITE) flies on the shuttle for first lidar in space.

1995: Langley awarded FAI Diplome d'Honneur, an international honor, for work in wind shear detection.

1996: Mars rover *Sojourner* lands with Entry, Descent and Landing calculations from Langley.

- The FAI Diplome d'Honneur is awarded for Langley-led Advanced General Aviation Transport Experiment (AGATE) program,

1997: Launch of Clouds and Earth's Radiant Energy System (CERES), to learn how clouds affect our atmosphere.

2000s

2000: Langley-pioneered electronic display cockpit is installed in Space Shuttle Atlantis.

2002: A model of Mars robotic aircraft, ARES, is successfully tested in conditions similar to flight through Mars atmosphere.

2003-06: For space shuttle Return to Flight, Langley studies aerothermodynamic properties of wing damage and insulating foam properties.

- Nondestructive evaluation of the shuttle thermal protection system and wing leading edge repair techniques are developed.

2004: Rovers *Spirit* and *Opportunity* land on Mars with help from Langley on flight hardware, Entry, Descent, and Landing and the parachute system.

- X-43 scramjet engine sets speed record for air-breathing engines at Mach 9.6. Langley led vehicle design and wind tunnel testing.

2005: Langley conducts simulations and thermal analyses for aerobreaking for the Mars Reconnaissance Orbiter spacecraft.

- Small Aircraft Transportation System (SATS) consortium, led by Langley, demonstrates technologies to increase volume at small airports, help pilots with safety and performance.
- Quiet Technology Demonstrator 2, a joint Langley, industry, and academia project, confirms effectiveness of engine nozzle chevrons, and other noise-reducing technologies.

2006: Cloud Aerosol Lidar and Infrared Pathfinder Satellite Observations, CALIPSO, launches to study Earth's climate, and air quality.

- NASA space capsule, *Stardust*, returns after collecting dust samples from a comet. Langley helps with Entry, Descent and Landing.
- Space Shuttle *Discovery* takes off for first Return to Flight. Foam insulation breaks loose on takeoff delaying next shuttle flight one year.
- CALIPSO and CloudSat satellites launched.

2007: Aeronomy of Ice in the Mesosphere mission (AIM) launched to study polar mesospheric clouds. Langley's James Russell III is principal investigator.

2008: Langley shares the Collier Trophy for Automatic Dependent Surveillance-Broadcast, which uses GPS information, air traffic data, and real time displays with Ames Research Center.

- After 10-month, 422 million mile journey, Phoenix Mars Lander lands safely. Langley works on Entry, Descent and Landing system.

2009: Langley shares the Collier Trophy awarded to Commercial Aviation Safety Team (CAST) established in 1997 to reduce the rate of fatal accidents.

- A rocket carrying a satellite to study global warming, the Orbiting Carbon Observatory, crashes near the Antarctic.
- Inflatable Re-entry Vehicle Experiment (IRVE) demonstrates that an inflatable heat shield can protect spacecraft at hypersonic re-entry speeds.

2010s

2010: Orion Launch Abort System, developed by Langley, completes Pad Abort-1 test at White Sands Missile Range, N.M.

- X-51A set flight duration record of 200 seconds for scramjet engine – tested in the Langley 8-Ft High Temperature Tunnel.

2011: Hydro Impact Basin added to Landing Impact Research facility. Orion spacecraft water landing tests begin.

- Langley's new headquarters building opens.
- HL-20 lifting body technology transferred to Sierra Nevada corporation as a basis for the development of "Dream Chaser" spacecraft.

2012: Richard T. Whitcomb is inducted posthumously into National Aviation Hall of Fame.

- Mars Science Lab rover, *Curiosity* lands on Mars with contributions from Langley in Entry, Descent and Landing and parachute systems.
- MSL Entry, Descent, and Landing Instrumentation (MEDLI) project measures aerothermal and aerodynamic data during entry.
- SpaceX Dragon spacecraft resupplies the ISS and safely returns scientific cargo, for the first commercial resupply and return mission.

2013: Four payload configurations of the Space Launch System are tested in Langley wind tunnels.

- NASA Langley and U.S.Navy practice recovery of Orion test capsule at Naval Station Norfolk in preparation for Fall 2014 test launch.
- Langley tests alternative biofuel for aircraft.

2014: Orion spacecraft makes first test flight from KSC. Langley contributes to heat shield technology.

- Langley's Integrated Engineering Services Building opens.
- Orbital Sciences successfully sends supplies to the ISS aboard its Cygnus cargo spacecraft.
- DISCOVER-AQ ends a four-year Langley-led field study to improve the ability to measure near-surface air quality conditions from space.
- The Integrated Structural Assembly of Advanced Composites or ISAAC robot is installed for faster and more economic development of experimental aerospace structures.

2015: SpaceX Falcon 9 rocket with Dragon begins fifth commercial resupply mission to the ISS.

- NASA marks the 100th anniversary of NACA.
- Dawn spacecraft orbits dwarf planet Ceres.
- Langley named a Vertical Flight Heritage Site by American Helicopter Society (AHS) International.
- NASA Langley's groundbreaking for the Computational Research Facility starts.

https://www.nasa.gov/langley